

Patent claims

1. Highly repetitive laser system according to the principle of the regenerative amplifier, comprising at least
- an amplifying laser medium (6),
 - a laser resonator having at least one resonator mirror (5) and at least one modulator (3) and
 - a pump source, in particular a laser diode source, for pumping the laser medium (6),
- characterized in that the laser resonator has a pulse stretcher (7, 8a, 8b) having a structure- and/or material-related highly dispersive effect.
2. Highly repetitive laser system according to Claim 1, characterized in that the pulse stretcher (7, 8a, 8b) has a minimum 3rd order dispersion in combination with maximum 2nd order dispersion.
3. Highly repetitive laser system according to Claim 1 or 2, characterized in that the pulse stretcher (7) has a block of highly dispersive material, in particular comprising SF57 glass, SF10 glass or BK7 glass.
4. Highly repetitive laser system according to Claim 3, characterized in that multiple reflection takes place within the block, in particular by reflection at interfaces.
5. Highly repetitive laser system according to any of the preceding Claims, characterized in that the

pulse stretcher (8a, 8b) has a Gires-Tournois interferometer or a dispersive layer structure, preferably as a folding mirror.

- 5 6. Highly repetitive laser system according to Claim 5, characterized in that the pulse stretcher (8a, 8b) has at least two reflecting surfaces, the surfaces being arranged in such a way that the surfaces are oriented
- 10 - relative to one another and
 - at an opening angle, in particular adjustable opening angle,
and the laser beam is reflected at least twice at at least one of the surfaces.
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7. Highly repetitive laser system according to any of the preceding Claims, characterized in that the laser medium (6) has an inversion life time greater than 1 ms and is in particular Yb:glass or
- 20 Yb:crystal.
8. Highly repetitive laser system according to any of the preceding Claims, characterized by a femtosecond oscillator (13) for inputting seed
- 25 pulses, the femtosecond oscillator (13) being formed and arranged in such a way that the seed pulses are femtosecond pulses or picosecond pulses on input into the laser resonator.
- 30 9. Highly repetitive laser system according to any of the preceding Claims, characterized by an electro-optical switching element as modulator (3).

10. Highly repetitive laser system according to any of the preceding Claims, characterized by a pulse compressor outside the laser resonator, in particular according to the Treacy design.

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11. Highly repetitive laser system according to Claim 10, characterized in that the pulse compressor has a dispersive grating having less than 1700 lines/mm, preferably less than 1200 lines/mm.

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